

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: K. HONDA, et al

Serial No.: 10/749,411

Filed: January 2, 2004

For: VIRTUALIZATION CONTROLLER, ACCESS PATH CONTROL
METHOD AND COMPUTER SYSTEM**PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(MPEP §708.02)****MS Petition**Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 11, 2005

Sir:

Applicants hereby petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP §708.02(VIII), Applicants state the following.

(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h).

The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention.

If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status.

(C) A pre-examination search has been conducted.

The search was directed towards a storage system. In particular, the search was directed towards a virtualization controller, an access path control method and a computer system in which at least one storage, at least one host computer and a virtualization controller are connected to each other.

According to the present invention, the virtualization controller, being connected to at least one storage and at least one host computer includes a plurality of ports connected to one or both of the host computer and the storage and at least one storage controller.

Further, according to the present invention, each of the ports and the storage controllers of the virtualization controller includes a virtualization processor which holds corresponding information between first identification information and second identification information, wherein the first identification information is used for the host computer to access a storage area held by the storage and the second identification information is used for the virtualization controller to identify the storage area. The virtualization processor converts, based on the corresponding information, data having the first identification information received from the host computer into data having the second identification information, transfers the converted data to a storage having the storage area, converts data having the second identification information received from the storage into data having the first identification information and transfers the converted data to the host computer.

The virtualization processor further includes access path management information which registers a first port controlled by the host computer, a second port connected to the storage and the virtualization processor, as an access path for each storage area of the storage. According to the present invention, when a request for changing the access path is received, the access path management information is updated and data send/receive control is carried out between the host and the storage area of the storage by use of a new access path.

The access path control method according to present invention executes a change process of data identification information sent and received between a host computer and a storage and executes a conversion process of the identification information allocated to a storage area and carries out access path switching.

The access path control method detects a start-up timing of the switching process of the virtualization processor allocated with respect to each storage area held by the storage, monitors a processing status of an access requested issued to the storage area which is a target for the switching process or the virtualization processor, temporarily queues the access request to the storage area which is a target for the switching process, newly received from the host computer, when incomplete access request exist, or which issues an instruction for changing the virtualization processor, to each of the modules which constitutes the virtualization controller and relate to the switching process of the virtualization processor when the incomplete access request does not exist, and issues the access request thus queued to a new virtualization processor, at

timing when a completion report as the instruction for changing the virtualization processor is received.

The computer system according to the present invention includes at least one storage, at least one host computer and a virtualization controller. The virtualization controller included in the computer system has features the same or similar to that of the virtualization controller described above.

The search of the above features was conducted in the following areas:

<u>Class</u>	<u>Subclasses</u>
711	112, 114, 158, 162, 165, 202

Additionally, a computer database search was conducted on the USPTO systems EAST and WEST.

(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:

<u>U.S. Patent Application Publication No.</u>	<u>Inventor(s)</u>
2003/0188114	Lubbers et al
2004/0034751	Horn et al
2004/0103264	Honda et al
2004/0260861	Serizawa
2005/0005062	Liu et al
 <u>Foreign Patent Application</u>	
JP 40-3127157	Watanabe

A copy of each of these references (as well as other references uncovered during the search) is enclosed in an accompanying IDS.

(E) It is submitted that the present invention is patentable over the references for the following reasons.

It is submitted that the cited references, whether considered alone or in combination, fail to teach or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to teach or suggest at least one or more of a first feature of the present invention wherein a virtualization processor is provided within a port or a storage controller of a virtualization controller and the virtualization processor holds corresponding information between first identification information and second identification information wherein the first identification information is used for the host computer to access a storage area by the storage and the second identification information is used for the virtualization controller to identify the storage area; a second feature of the present invention wherein the virtualization processor converts data having the first identification information received from the host computer into data having the second identification information, transfers the converted data to a storage having the storage area, converts data having the second identification information received from the storage into data having the first identification information and transfers the converted data into the host computer; a third feature of the present invention wherein the virtualization processor includes access path management information which registers a first port controlled by the host computer, a second port connected to the storage and the virtualization processor as an access path for each storage area of the storage; and a fourth feature of the present invention wherein the access path control method monitors

a processing status of an access request issued from the storage area which is a target for the switching process of the virtualization processor and temporarily queues the access request to the storage area which is a target for the switching process, newly received from the host computer, when incomplete access request exist, or which issues an instruction for changing the virtualization processor, to each of the modules which constitutes the virtualization controller and relate to the switching process or the virtualization processor when the incomplete access request does not exist.

All of the independent claims recite at least one of the above described first, second, third and fourth features of the present invention. Particularly, the first, second and third features are recited in claims 1-6 and 8 and the fourth feature is recited in claim 7.

The references considered most closely related to the claimed invention are briefly discussed below:

Lubbers (U.S. Patent Application Publication No. 2003/0188114) shows data replication with virtualized volumes. The system has a data replication controller for managing replication of in a storage area network. The data replication controller includes: a data processor system configured to implement software processes; a pool of virtualized storage accessible through the data processor system; processes executing in the processor to enable the data replication controller to couple to an external communication network; processes executing in the processor for designating a virtual disk as a source virtual disk; and processes executing in the processor to enable the data replication controller

to cause a second data replication controller to create a destination virtual disk. (See, e.g., Abstract, FIGS. 1-6, and paragraphs [0013], [0021], [0032]-[0034], and [0045]-[0052]).

However, Lubbers does not teach or suggest the use of a virtualization processor that includes access path management information. Particularly, Lubbers does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Horn (U.S. Patent Application Publication No. U.S. 2004/0034751) shows asymmetrical load balancing in a networked. storage system that includes several storage volumes and a networked storage system controller/virtualizer. The networked storage system controller/virtualizer further includes a first transaction processor and, optionally, a second transaction processor. In one networked storage system controller/virtualizer implementation, the transaction processors may use one of a plurality of available paths to communicate to a number of storage volumes in the storage system. The networked storage system controller/virtualizer acquires real-time knowledge of the path and storage volume workload. The hardware-accelerated transaction processor performs a cost function calculation in real-time on a per-command basis in order to continually determine the optimal storage volume to access and optimum path routing. The cost function is calculated considering the number of outstanding commands, the number of pending commands, and the size of commands, in order to continually balance the load of command traffic across the storage system. (See, e.g., Abstract, FIGS. 1-3, and paragraph [0008], [0013]-[0015], and

[0018]-[0021]).

However, Horn does not teach or suggest the use of the first identification information for a host computer to access a storage area and the second identification information for a virtualization controller to identify a storage area. Particularly, Horn does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Honda (U.S. Patent Application Publication No. U.S. 2004/0103261) shows a virtualization controller for controlling data transfer between a host system and a plurality of storage devices. The system includes a plurality of first ports for connection with the plurality of storage devices, each of which has a storage area to store data. A second port is included for connection with the host system. Also included are a processor and a memory configured to store volume mapping information which correlates first identification information used by the host system to access a first storage area in one of the storage devices, with second identification information for identifying the first storage area. The correlation is used by the processor to access the first storage area. When data stored in the first storage area is transferred to a second storage area in one of the storage devices, the processor correlates the first identification information with a third identification information for identifying the second storage area, and registers the first identification information and the third identification information in the volume mapping information. (See, e.g., Abstract, FIGS. 1-30, and paragraphs [0007]-[0012], [0176], and [0219]-[0227]).

However, Honda does not teach or suggest a virtualization processor that

converts data having a first identification information received from a host computer into data having a second identification information, transfers the data to a storage having a storage area, as well as receiving data from the storage area and converting the data into the data having the first identification information, and sending it to the host computer. Particularly, Honda does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Serizawa (U.S. Patent Application Publication No 2004/0260861) shows a method for allocating a storage area to a virtual volume. The system includes a plurality of storage systems, each of which has a controller and a disk, and a virtualization apparatus coupled to the plurality of storage systems. The virtualization apparatus includes an input port to be coupled to a computer, an output port to be coupled to the storage systems, a transfer unit which transfers data between an input port and an output port, a control unit, and an access conversion table that records a matching relationship between a virtual volume that is a target of an access request from a computer and storage areas of the plurality of storage systems that are allocated to the virtual volume. The control unit, upon receiving a write request issued by the computer to the virtual volume, allocates a storage area of the plurality of storage systems to the virtual volume, and updates the access conversion table. The virtualization apparatus notifies the computer, according to a request from the computer, of virtual volume identification information to identify the virtual volume and the size of the virtual volume. (See, e.g., Abstract, FIGS. 1-10, and paragraphs [0005]-[0009], and

[0024]-[0040]).

However, Serizawa does not teach or suggest the use of a virtualization processor that includes access path management information. Particularly, Serizawa does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Liu (U.S. Patent Application Publication No. 2005/0005062) shows a redundant external storage virtualization computer system. The system includes a host entity for issuing an I/O request, a redundant storage virtualization controller pair coupled to the host entity for performing an I/O operation in response to the I/O request issued by the host entity, and a plurality of physical storage devices for providing storage to the computer system. Each of the physical storage devices are coupled to the redundant storage virtualization controller pair through a point-to-point serial-signal interconnect. The redundant storage virtualization controller pair includes a first and second storage virtualization controller coupled to the host entity. In the redundant storage virtualization controller pair, when the first storage virtualization controller is not on line or not in operation, the second storage virtualization controller will take over the functionality originally performed by the first storage virtualization controller. (See, e.g., Abstract, FIGS. 1-45, and paragraphs [0023]-[0026], and [0073]-[0079]).

However, Liu does not teach or suggest the use of a virtualization processor including access path management information, as well as the use of the first identification information for host computer to access a storage area, and

the second identification information for the virtualization controller to identify a storage area. Particularly, Liu does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Watanabe (JP403127157 A) shows a load balancing control system for a storage device to prove the availability of the storage device by storing an access sequence, an execution frequency, and an access waiting frequency, defining the execution priority of an access request, and optimizing an execution sequence of the access request from plural access paths. (See, Abstract).

However, Watanabe does not teach or suggest the use of a virtualization controller connected to storages and host computers including a virtualization processor. Particularly, Watanabe does not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above.

Therefore, since the references particularly, Lubbers, Horn, Honda, Serizawa, Liu and Watanabe do not teach or suggest one or more of the first, second, third and fourth features of the present invention as described above, it is submitted that all of the claims are patentable over the cited references.

(F) Conclusion

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The United States Patent and Trademark Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the United States

Patent and Trademark Office may locate in its own independent search. Further, while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the United States Patent and Trademark Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

(G) Fee (37 C.F.R. 1.17(i))

The fee required by 37 C.F.R. § 1.17(i) is to be paid by:

☒ the Credit Card Payment Form (attached) for \$130.00.

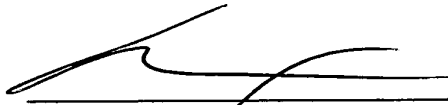
☐ charging Account _____ the sum of \$130.00.

A duplicate of this petition is attached.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (566.43395X00).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.



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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

PETITION FEE Under 37 CFR 1.17(f), (g) & (h) TRANSMITTAL (Fees are subject to annual revision)		Application Number	10/749,411
		Filing Date	January 2, 2004
		First Named Inventor	K. HONDA, et al
		Art Unit	
		Examiner Name	
		Attorney Docket Number	566.43395X00


Enclosed is a petition filed under 37 CFR §1.102(a) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of \$ 130.00 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition (fees))

- ☒ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. 50-1417:
- ☐ petition fee under 37 CFR 1.17(f), (g) or (h) ☒ any deficiency of fees and credit of any overpayments
- Enclose a duplicative copy of this form for fee processing.
- ☐ Check in the amount of \$ _____ is enclosed.
- ☒ Payment by credit card (From PTO-2038 or equivalent enclosed). Do not provide credit card information on this form.

Petition Fees under 37 CFR 1.17(f): For petitions filed under: § 1.53(e) - to accord a filing date. § 1.57(a) - to according a filing date. § 1.182 - for decision on a question not specifically provided for. § 1.183 - to suspend the rules. § 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent. § 1.741(b) - to accord a filing date to an application under §1.740 for extension of a patent term.	Fee \$400	Fee Code 1462
Petition Fees under 37 CFR 1.17(g): For petitions filed under: §1.12 - for access to an assignment record. §1.14 - for access to an application. §1.47 - for filing by other than all the inventors or a person not the inventor. §1.59 - for expungement of information. §1.103(a) - to suspend action in an application. §1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available. §1.295 - for review of refusal to publish a statutory invention registration. §1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued. §1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent. §1.550(c) - for patent owner requests for extension of time in <u>ex parte</u> reexamination proceedings. §1.956 - for patent owner requests for extension of time in <u>inter partes</u> reexamination proceedings. § 5.12 - for expedited handling of a foreign filing license. § 5.15 - for changing the scope of a license. § 5.25 - for retroactive license.	Fee \$200	Fee code 1463
Petition Fees under 37 CFR 1.17(h): For petitions filed under: §1.19(g) - to request documents in a form other than that provided in this part. §1.84 - for accepting color drawings or photographs. §1.91 - for entry of a model or exhibit. §1.102(d) - to make an application special. §1.138(c) - to expressly abandon an application to avoid publication. §1.313 - to withdraw an application from issue. §1.314 - to defer issuance of a patent.	Fee \$130	Fee Code 1464

Name (Print/Type)	Carl I. Brundidge	Registration No. (Attorney/Agent)	29,621
Signature		Date	March 11, 2005

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.